During the past decade, there has been increasing interest and discussion regarding vitreomacular adhesion (VMA) and traction. This interest has been driven by greater use of optical coherence tomography by community eye care providers, leading to more referrals to retina and the U.S. Food and Drug Administration (FDA)-approval of ocriplasmin (Jetrea; ThromboGenics, Leuven, Belgium), the first treatment for symptomatic VMA in 2012. Usage of Jetrea since FDA approval has dropped to negligible levels given its high side effect profile and cost, as well as the availability of alternate treatments (observation, pneumatic vitreolysis, and small-gauge vitrectomy).

Dilsher S. Dhoot, MD, and Nathan C. Steinle, MD, provide us with an overview of the current treatment options for the management of vitreomacular traction. In this article, they will summarize the literature and discuss the pros and cons of each treatment (including observation) for managing patients suffering from this condition. They will also share their research on the use of pneumatic vitreolysis to treat this condition and present an illustrative case.

I am certain that the insights and expertise that Drs. Dhoot and Steinle share will be very helpful as we encounter patients with symptomatic vitreomacular traction in our clinics.

**Current Treatment Options for the Management of Vitreomacular Traction**

by Dilsher S. Dhoot, MD, and Nathan C. Steinle, MD

Posterior vitreous detachment (PVD) is a common occurrence in the aging eye. By the age of 70, a complete PVD is present in at least 50% of individuals.\(^1\)\(^-\)\(^3\) Although the majority of PVDs occur without complication, a small proportion can be associated with a persistent vitreomacular adhesion (VMA) at the fovea resulting in tractional forces and vitreomacular traction (VMT) (Figure 1). With the increasing adoption of optical coherence tomography (OCT) by community providers, such as optometrists, the identification of VMT in patients has increased, though limited information on the epidemiology of VMT is available in the literature currently.

The International Vitreomacular Traction Study Group recently developed an OCT-based classification of vitreomacular interface disorders including VMT. VMA was defined as a perifoveal vitreous cortex detachment from the retinal surface with a macular attachment of the vitreous cortex within a 3-mm radius of the fovea. In VMA, no changes are seen in underlying foveal contour or retinal tissue. VMT was further defined as VMA with associated distortion of the foveal surface, but no full-thickness hole.\(^4\)

Symptomatic VMT can result in a variety of visual symptoms, though typically metamorphopsia, photopsia, and/or blurred or decreased vision are reported. Current management strategies focus on achieving resolution of traction and include observation, medical therapy, and surgery.

**OBSERVATION**

Several recent studies have evaluated and reported the natural history of VMA/VMT. One of the largest of these studies included 230 eyes of 185 patients followed during a mean of...
In this case series, spontaneous release of VMT occurred in 73 eyes (31.7%). However, spontaneous release occurred at a mean of 18 months after presentation. In a smaller series of 106 eyes evaluated in a retrospective fashion, the authors found a spontaneous VMA release rate of 32% (34 eyes). Hikichi et al. reported a much lower rate of spontaneous release of 11% after a median of 60 months of follow-up. Factors that may be predictive of spontaneous VMT release include an adhesion diameter less than 400 µm, eyes with isolated inner retinal distortion, and eyes receiving intravitreal injections for comorbid disease states.

**MEDICAL THERAPY**

In-office interventions for symptomatic VMT currently include intravitreal ocriplasmin (Jetrea; Thrombogenics, Leuven, Belgium) or intravitreal gas injection.

The enzyme ocriplasmin was approved for the treatment of symptomatic VMT in 2012 by the U.S. Food and Drug Administration. The MIVI-TRUST trials were two parallel phase 3 trials that demonstrated the efficacy of ocriplasmin for this indication. A total of 652 eyes were included, of which 464 received 0.125 mg ocriplasmin for VMT. The primary endpoint at day 28 following injection was the percentage of patients achieving VMA release (26.5 vs. 10.1% of controls; \( P < .001 \)), macular hole (MH) closure (40.6 vs. 10.6% of controls; \( P < .001 \)), and complete PVD (13.4 vs. 3.7% of controls; \( P < .001 \)). Improved results in VMT resolution were associated with younger age (< 65 years), smaller adhesions (< 1,500 µm), phakic eyes, absence of epiretinal membrane, and presence of a full-thickness MH with VMA. Several groups have reported “real world” results using ocriplasmin ranging from a VMT release rate of 42.1% to 50% and a MH resolution rate of 17% to 80%. These studies also confirmed the factors associated with higher odds of success using ocriplasmin reported in the MIVI-TRUST subgroup analyses.

Initial reports of transient visual disturbances and OCT and electroretinogram (ERG) changes have stymied widespread adaptation of ocriplasmin for VMT. In the MIVI-TRUST trials, blurred vision occurred more in ocriplasmin-treated patients compared with controls (8.6 vs. 3.2%; \( P = .01 \)). OCT changes following ocriplasmin injection have been reported by several groups. Ellipsoid zone alterations and subretinal fluid accumulation are the most characteristic of these changes. Quezada-Ruiz et al. reported 43.47% (10 of 23 eyes) developing such ellipsoid alterations; notably, these alterations resolved in all eyes at 1 month following treatment. ERG changes have been reported from the MIVI-TRUST trial and more recently from the OASIS study. OASIS evaluated 220 patients randomized to receive either ocriplasmin 0.125 mg or control vehicle in a 2:1 fashion. These patients were followed during the course of 24 months. Sixty-one of the patients in OASIS study (40 ocriplasmin patients and 21 control patients) were further analyzed in an ERG substudy. ERG changes were defined as a greater-than-40% change from baseline. Sixteen of 41 eyes...
(40%) in the ocriplasmin group had ERG changes compared to one of 21 eyes (4.8%) in the control group. Notably, eyes with ERG changes maintained or gained visual acuity, and by the end of the study period, 13 of 41 eyes (81.3%) had resolution of ERG changes.\(^\text{19}\) Further research is needed to fully assess the long-term ramifications of the observed OCT and ERG changes.

Pneumatic vitreolysis is a term used to describe intravitreal gas injection for the purposes of creating a PVD and resolving VMT (Figures 2 and 3). Rodriguez et al. reported a 60% resolution of VMT at 6 months (nine of 15 eyes) with intravitreal gas injection of 0.3 mL of 100% C3F8 (perfluoropropane).\(^\text{20}\) More recently, Steinle et al. reported a series of 30 patients undergoing intravitreal C3F8 injection for VMT with

---

**Figure 2.** (Left) Vitreomacular traction (VMT) with significant outer retinal changes at baseline. (Right) Following pneumatic vitreolysis with C3F8 gas, the VMT released and the foveal contour improved.

**Figure 3.** (Left) Vitreomacular traction (VMT) with significant outer retinal changes at baseline. (Right) Following pneumatic vitreolysis with C3F8 gas, the VMT released and the foveal contour improved.
an overall release rate of 83%. After gas injection, VMT release occurred overnight in some patients and was documented on OCT at an average of 13 days (range: 1 day to 62 days). In this series, eyes with epiretinal membranes, concurrent diabetes mellitus, or eyes previously treated with ocriplasmin without release of VMT were also successfully treated with C3F8 gas.21 Notably, in both the Rodriguez and the Steinle series, no cases of retinal breaks or detachment were seen in the reported follow-up periods. Altitudinal considerations may limit the use of pneumatic vitreolysis in mountainous geographical regions.

**Surgery**

Pars plana vitrectomy (PPV) for the treatment of VMT has been shown to be a definitive and effective solution.22,23 Moreover, in the current era of small-gauge vitrectomy, the risk/benefit profile of PPV may in fact be more favorable with shorter operating times.24 Potential disadvantages, including cost, cataract formation, ERM formation, and risk of retinal detachment, have served to enhance interest in medical management options.

In summary, several options are currently available for the management of symptomatic VMT, including observation, medical therapy, and surgery. Tailoring the various options to the needs of the patient and the characteristics of the VMT is ultimately the best strategy.

**References**